LumiCal Delphes simulation (implementation as Forward Detector)

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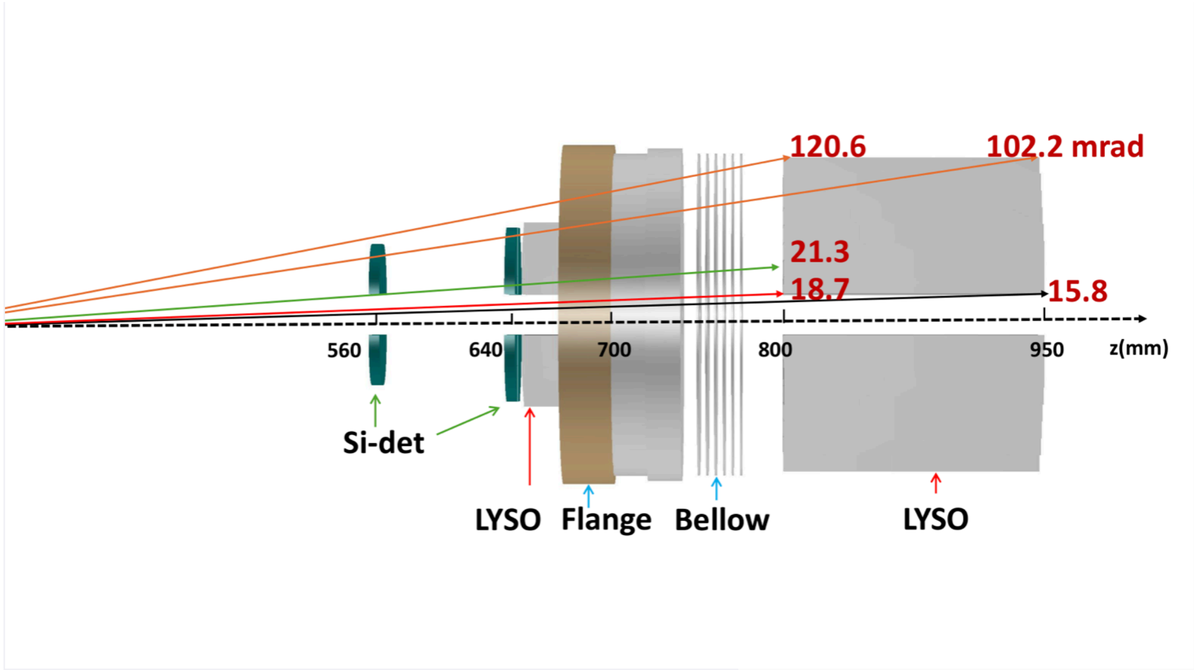
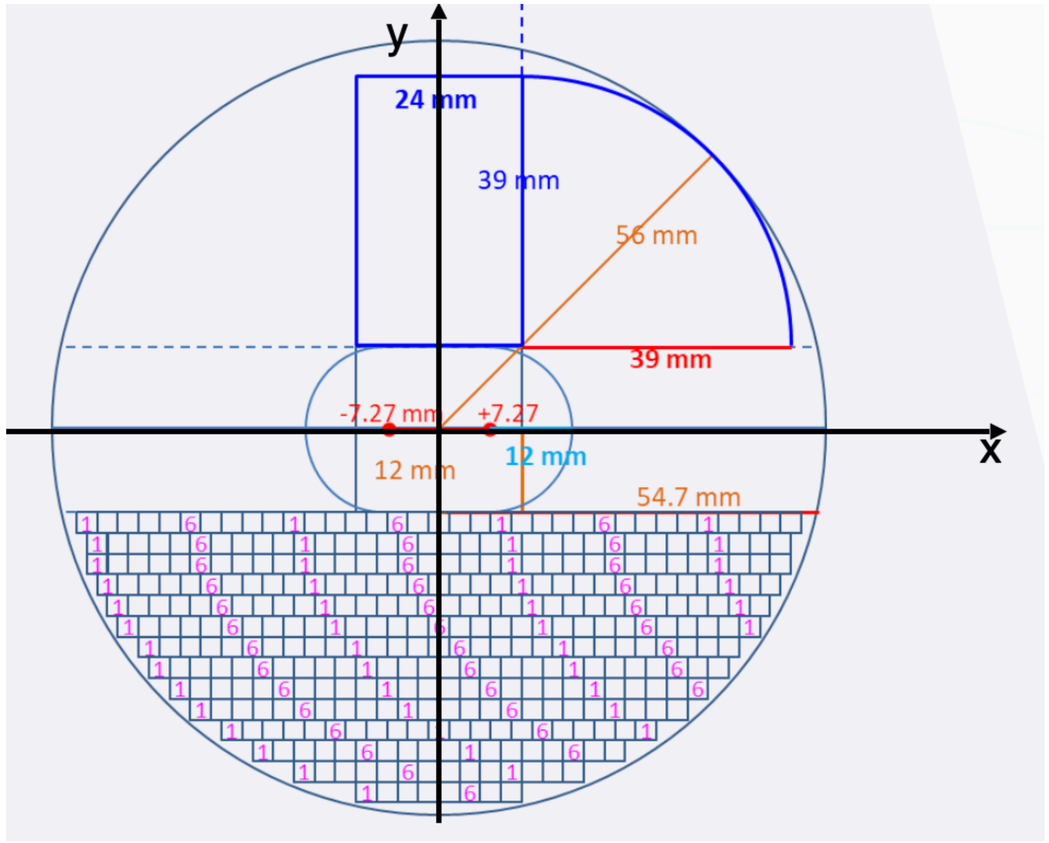
Motivation

- LumiCal can be used in Forward region to detect the photons and electrons in the forward region $3.2 < \eta < 4.6$
- First layer Si-det distinguishes photons and electrons
- LYSO crystals measure the energy



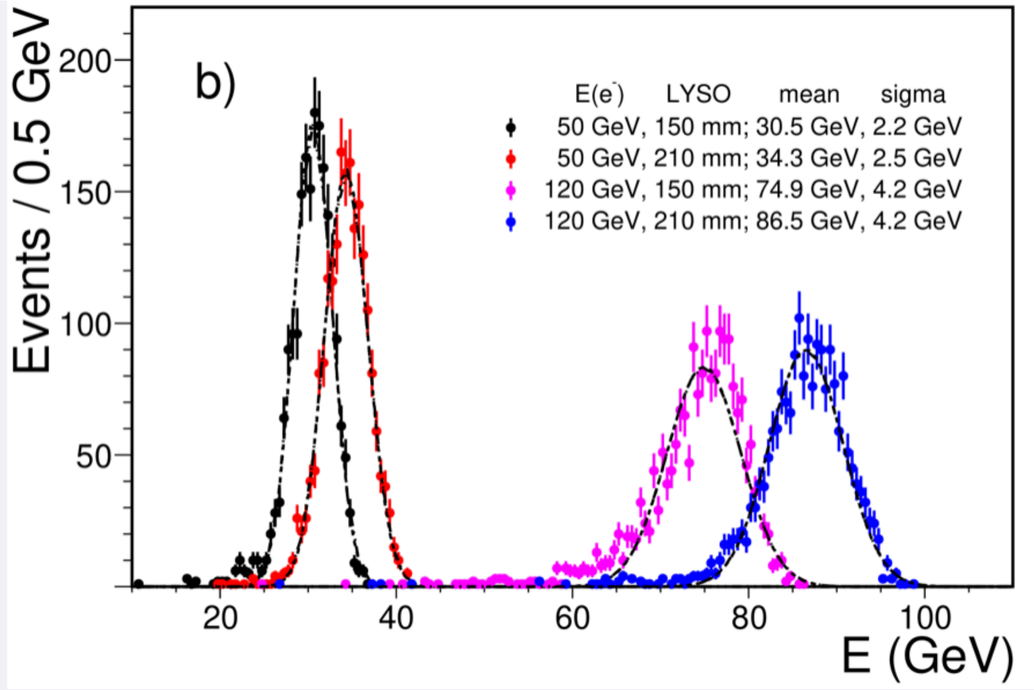
Geometry

- Geometry is obtained from LumiCal .xml file
- 2 layers of Si-dets, 2 LYSO crystals, flange and below
- The positions of cells is recalculated into φ and η for Delphes fast simulation



Energy resolution

- Energy resolution is obtained from LYSO 210mm crystals simulation provided from LumiCal group
- $$\frac{\sigma}{E} = a^2 + \left(\frac{b}{\sqrt{E}}\right)^2$$
- $a = 0.016$ and $b = 0.50$ is obtained
- $25X_0$ energy deposits in the LumiCal

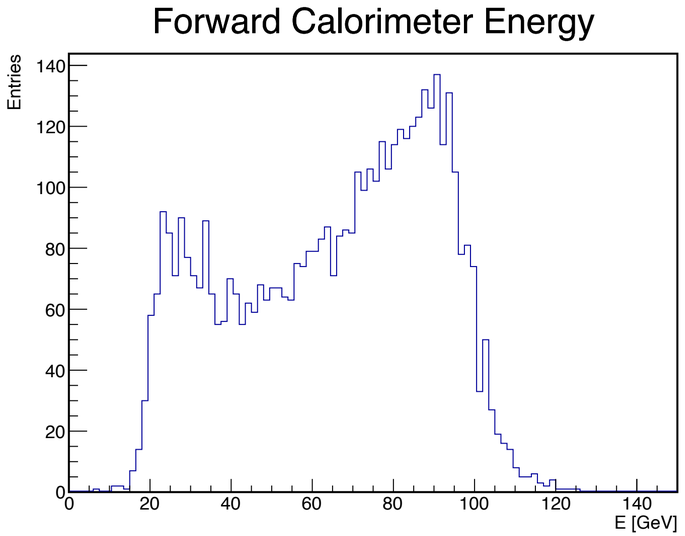


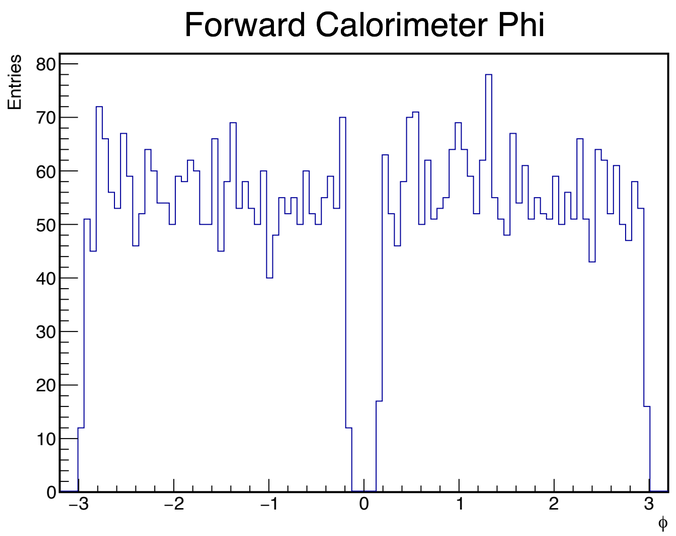
Delphes implementation

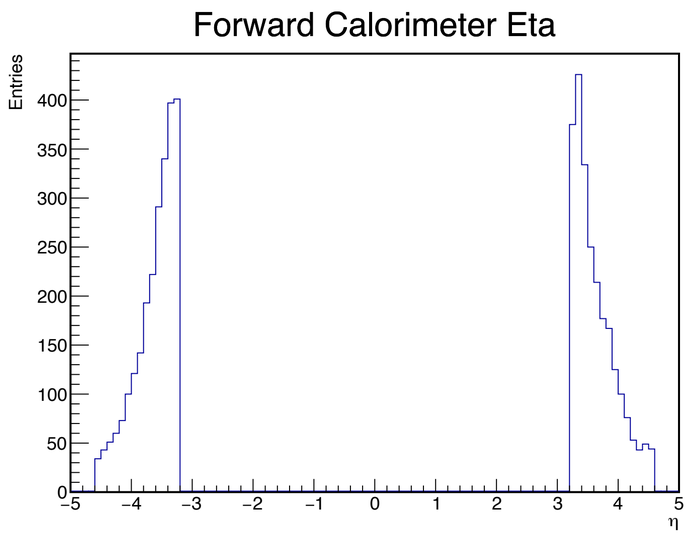
- Added new DelphesClass which stores only Energy of the particle (no momentum)
- Added new DelphesModule — ForwardCalorimeter. It distinguishes photons and electrons, uses geometry of the Forward Calorimeter, smears energies and writes 2 branches — Photon_forward and Electron_forward to the final TTree
- Added ForwardCalorimeter module to delphes_card_CEPC.tcl card

Results

$$e^+e^- \rightarrow e^+e^-\nu^e\bar{\nu}^e$$







Results

$e^+e^- \rightarrow \gamma\gamma$